

### **Mayhem in Durham-Remembering the Fallen**





Above: The April 2019 gas explosion in Durham, NC resulted in two fatalities, severe injuries and damage to property. Photo courtesy: Spectrum News.

One-call centers across the country celebrated April 2019 as a record-breaking month in terms of tickets processed, while the Common Ground Alliance touted their annual National Safe Digging Month as a "record-breaking success" in terms of calls to their Call811.com website. Unfortunately, another record that was possibly broken was the number of people killed in one month as a result of underground utility excavations.

#### **EXCAVATION INCIDENTS**

April saw no less than SIX excavating-related fatalities across the countrytwo from the massive explosion in downtown Durham, and four from three separate trench collapse incidents. On April 10th, a fiber crew digging under a sidewalk in downtown Durham, North Carolina struck a gas service line with a horizontal directional drilling rig. After first calling 811 to report the smell of escaping gas, the caller then called 911 to have the nearby buildings evacuated. The explosion occurred 30 minutes after this 911 call, completely destroying the Studebaker building and its ground-level coffee shop, and killing the owner of the shop, Mr. Kong Lee. Twenty-five other people were wounded and taken to the hospital, including nine firefighters and two utility workers.

On April 25th, 15 days after this devastating explosion, critically injured utility worker Jay Rambeaut succumbed to his injuries sustained during the incident and passed away. His family was guoted as saying that because of the explosion, he had 150 holes in his chest from flying debris, as well as burns, broken bones, a skull fracture and debris in his brain. Rambeaut worked as a first responder locator for Dominion Energy and had been called to the scene of the ruptured gas line to shut off the gas. The energy company released this statement after his death:

Dominion Energy today confirmed the death overnight of Jay Rambeaut, who was injured in Durham on April 10. He worked as a Locator and First Responder-an investigative job that required him to go on site when something might be wrong. He originally joined the company in 1988. "This job can be dangerous, and Jay demonstrated the skill and courage this job requires," said Tom Farrell, Dominion Energy CEO. "I ask you to keep his family in your thoughts. I know I will say an extra prayer tonight."

#### **TRENCH COLLAPSES**

Another continual danger of underground utility installation that often gets overlooked is the threat of trench collapses, a problem that is ALWAYS preventable. Unfortunately, a twelve day stretch in April saw four deaths due to trench collapses.



Above: Durham gas explosion at 115 N. Duke St., former site of the Kaffeinate coffee shop. Photo courtesy: Spectrum News.

#### April 6th

Dalbert Burton was working alone, trenching for sewer pipe at a residential construction site in Sugarcreek Township, Ohio, when he was found dead at the bottom of a collapsed 14-foot deep trench. A neighbor noticed machinery running without an operator, and then called 911. It is probable that Mr. Burton had been trapped for hours before anyone noticed. Mr. Burton was a married father of three, grandfather of two, and had just celebrated his 24th anniversary with his wife.

#### **April 11th**

Christopher MacDonald was replacing culverts and working to replace water lines in Marysville, Ohio when a 20-foot trench collapsed, killing him Marysville Fire Chief Jay Riley said that a trench box, which helps prevent collapses, was not being used at the time of the incident.

Cristopher Ramirez's family said he is survived by his wife, who is pregnant April 18th with their baby boy, and extended family. "He left for work on Tuesday, like Cristopher Ramirez and Jorge Valadez were installing a sewer pipe in a any normal day at work, when things took a turn for the worse," they said. 15-foot deep trench at a new home construction site in Windsor, Colorado, "He was unable to tell those closest to him goodbye." Jorge Valadez's family when it collapsed on top of them. Over 100 first responders worked for described him as a "husband, father, son, brother and friend to man" who hours trying to rescue the two workers. One worker was completely buris survived by his wife and five children, ranging from six to 17 years old.



Above: Kong Lee, owner of the Kaffeinate coffee shop in Durham, was killed in the explosion as he was putting up a sign warning others to evacuate the area. Photo courtesy: Spectrum News.



Above: Jay Rambeaut, a contractor with PSNC/Dominion Energy, on scene to help stop the gas leak in Durham, who later died from injuries sustained from the explosion. Photo courtesy: Spectrum News.

ied but survived for hours after workers got a PVC pipe to him to help him breathe. The other worker was buried on top of the one using the PVC pipe and was not responding to rescuers when they arrived. Ultimately, first responders were unable to reach either worker in time before they died.

Early reports indicate that none of the three trenches involved in these fatal incidents were protected by sloping, shoring, or shielding with trench walls or trench boxes. The Occupational Safety and Health Administration confirmed it was investigating the deaths in Windsor and in Marysville, but did not elaborate any further. According to an OSHA factsheet, trenches five feet or deeper must have some sort of protective system in place unless the excavation is being done in stable rock. Scott Allen, an OSHA spokesperson, said that OSHA will take up to six months to complete their investigations, issue citations and propose penalties if violations are found.

#### **REMEMBER THE FALLEN**

If you're feeling a sense of deja vu about this some of this, it is because the explosion in Durham is remarkably similar to another major excavatingrelated explosion that American Locator covered in depth last year, the massive, fatal explosion in downtown Sun Prairie, Wisconsin.

While all of these recent deaths have done absolutely nothing to halt the breakneck, never-ending pace of underground installations across the country, some people in positions of power have decided to at least attempt to remember those people killed as a result of this work.

Sun Prairie Volunteer Fire Department Captain Cory Barr, who was killed on July 10th, 2018 in the gas explosion that destroyed the downtown area, may be memorialized by having the local post office named in his honor. Bipartisan legislation has been introduced in the U.S. Senate and Congress to honor Cory Barr, by re-naming the Sun Prairie post office the Fire Captain Cory Barr Post Office Building.

Senators Tammy Baldwin, D-Madison, and Ron Johnson, R-Oshkosh, introduced the bill to the Senate, while in the House, the entire Wisconsin delegation led by Rep. Mark Pocan, D-Black Earth, whose district includes Sun Prairie, introduced the legislation.

"Captain Cory Barr paid the ultimate sacrifice to protect Sun Prairie residents and save lives," Baldwin said. "His public service should be honored and his commitment to the safety of his neighbors and the community will always be remembered."

"The Sun Prairie community will forever be impacted by last summer's tragic explosion, but because of Captain Barr's heroic efforts, more than 100 people were led to safety," Pocan said. "We all owe Captain Barr our deepest respect for his exemplary service and the sacrifice he made for his community."

Kong Lee. Jay Rambeaut. Dalbert Burton. Christopher MacDonald. Cristopher Ramirez. Jorge Valadez. One month, six dead. Remember their names, and work to make sure that no more post offices have to be renamed because of our industry.





Above: Two workers were trapped after a trench collapse in Windsor, CO. Rescuers attempted to provide oxygen via PVC tubing. Photo courtesy: Windsor Severance Fire Rescue.



**Above:** Rescue efforts in Windsor continued into the night but were ultimately unsuccessful. Photo courtesy: Windsor Severance Fire Rescue.

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### Damage Review Dateline Follow-up

#### Homerville, Georgia - Millions in Fines Levied

In American Locator Vol. 32 Issue 6, we briefly covered the August 2018 gas explosion in Homerville, GA, bringing you details on the various circumstances that led up to the event. Since then, a state investigation into the incident that destroyed a local coffee shop and injured several women has proposed millions in fines against a local utility, Atlanta Gas and Light Company.

On Aug. 17, a construction crew installing fiber optic cable hit a gas line. Minutes later, the coffee shop exploded. Two employees and a customer were taken to an area hospital. Authorities determined that construction crews had also hit a sewer line leading to the business, which allowed gas to leak into the line.

In its investigation report, the PSC says Atlanta Gas and Light was in "probable violation" of federal safety standards involving locating and marking of natural gas facilities. The report also says PSC staff found "no evidence" that Atlanta Gas Light considered using a valve to stop the flow of gas to the damaged gas line or that AGL workers monitored gas levels in nearby buildings-both actions required by the company's own regulations.

The report says Atlanta Gas and Light didn't perform its own investigation into the pipeline damage but allowed a contractor, responsible for locating underground lines before digging could occur, to perform an investigation that was "fatally flawed."



The report states that the contractor's claim that the excavator "was boring outside of the scope of all locate requests called in for the area" was not factual and showed lack of proper investigation into the cause of the explosion. The report also claims the gas company did not conduct its own required drug and alcohol testing of involved employees. A PSC spokesperson commented the report would be forwarded to the full commission.







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arly this year, Planet Underground TV traveled to Evansville, Indiana, a large community on the Ohio River, to film the crews of On The Spot Utility Resources, a rapidly growing locate company expanding their footprint across the Midwest. It was a great opportunity to learn more about On The Spot, who had just been awarded a big new contract with a major utility in Indiana and Kentucky.

During our visit, we also met up with the head trainer of Staking University, Paul Larkin, who was hosting a series of five-day Staking University locator training classes at On The Spot's headquarters to help prepare their staff and support teams for the new contract ahead. For the first time, Planet Underground had the opportunity to film a Staking U class outside of our main Manteno campus. It was crucial that the training the locate crews received from Staking U was the best available and that new On The Spot recruits thoroughly and completely absorbed the information. They had no time to waste with the big contract coming in March and had to be sure their locators were well trained, safe and dependable.

Freezing cold temperatures and rain didn't present the best circumstances for filming, but our spirits lifted as we were greeted by On The Spot Owner and President, Allison Long, VP Brandon Long, and Randy Murray, who each told us a little more about the history and culture of the company.

Brandon and Randy had both previously worked for a larger contract locating company for about 20 years, and they finally decided that they were tired of working for a company that was maybe too big for its own good. From our interview with them, we could see their honest dedication to a culture of family and teamwork within their company. It's easy for executives at a company to boast about these things, but out in the field with some of their guys, one on one, we got the same vibe without even having to ask.

On their website, the company states, "On The Spot Utility Locating is a Woman Business Enterprise (WBE) founded in 2008 with one goal in mind: to replace the industry standard of transactional-based locating with an authentic partnership-driven approach specializing in damage prevention. We guide our business with three basic principles: precision, timeliness and integrity." Their company is growing because of a proven reputation for putting down more accurate and timely locates than the other large contract locate companies can, and they don't want their efficiency level to drop once they get the new contract. One way they are doing that is by dedicating different teams of locators to locate specific projects. For example: there are crews that only locate gas and electric, and crews who only locate water and sewer. So if a ticket is called in with all four utilities, you would see two separate On The Spot trucks onsite, locating their dedicated facilities.



Above: On The Spot gets the day started with new locator recruits. Below: Paul Larkin, Staking University trainer, offers sound advice on many technical aspects of locating properly.



Locating Technology



## A Field Study of Factors that Affect Depth Calculations

Author: Dennis Prezbindowski, Ph.D., GPR Instructor and Trainer with Staking University

Let's talk about ground penetrating radar (GPR) depth determinations as part of a continuing discussion of the use of GPR imaging to locate subsurface utilities (conductive and non-conductive) and subsurface structures and features that might represent financial and safety risks. In my experience, one of the most common questions that a GPR operator must deal with is "How deep is that target?" As all experienced GPR operators know, but sometimes fail to explain to others, GPR depth determinations can be erroneous due to changes in soil properties. GPR instruments measure the two-way travel time of an electromagnetic (EM) pulse from the transmitting antenna to a subsurface target and the reflected, returning EM portion of that pulse. The GPR depth to target is calculated by the GPR instrument using the two-way travel time (accurately measured) and an average substrate EM velocity (estimated). The biggest challenge in calculating an accurate depth to GPR target is the limitation in measuring accurate EM velocities to be used in-depth calculations over the project area.

What can a GPR operator do to determine a reasonable substrate velocity at a new project site? The GPR instrument manufacturers have provided several ways to approximate the EM subsurface velocities in the field so that approximate depths to GPR targets can be calculated. These are:

1) The ability to select among multiple, soil compositional types that closely approximates the soil conditions at your project site. These values can be in the form of a table (that can be manually entered), or soil condition categories provided as part of the setup procedure in the GPR instrument.

2) The calibration of the GPR can be accomplished by imaging a subsurface target of known depth (determined by exposure or probing) in your project area. This will allow the instrument to calculate an average substrate EM velocity for that location.

3) Use the technique of GPR target hyperbole (curve) matching to estimate the average velocity of the GPR EM pulses through the substrate at that location.

4) Measure the soil properties using a ground conductivity meter.

Each of these approaches has limitations and potential sources of error. As a result, the accuracies of calculated GPR target depths can vary across the project site. Based on my experience, the two most significant sources of error to GPR derived depth estimates are:

1) Error associated with the technique(s) used to estimate the substrate GPR velocities at the project site.

2) The lateral and vertical variations in substrate electromagnetic properties (GPR velocities) within a project area. Subsurface variability is common at many project sites. From a practical project point of view, it is impossible to quantify the amount of error that is associated with project-wide depth determinations made with a single velocity estimate.



Fig. 1: Google Earth photograph of a Northeast street corner in North Webster, Indiana. An extensive GPR survey was conducted to locate underground utilities and structures before the start of a construction project. This short article focuses on a small, detailed GPR grid imaging of a stormwater pipe that runs from the street stormwater catch basin to the stormwater catch basin located in the parking lot.



Fig. 2: Outline of the particular GPR grid project area (10' by 75' white dashed area) is shown. The green dashed arrow illustrates the approximate surface location of the subsurface, 12" diameter, metal, corrugated stormwater pipe running from the street to the storm water catch basin in the parking lot.



Fig. 3: Picture of the origin point of the 12" diameter, metal corrugated stormwater pipe running from the street to the storm water catch basin in the parking lot.

# Case Study of Rapid Lateral Changes in GPR Substrate Velocities

During nearly 18 years of conducting GPR imaging projects, I have noted that significant changes in GPR velocities in both lateral and vertical directions and seasonal changes are the norm. Recently, I conducted a GPR survey to help locate utilities and underground structures in a parking lot area that was to undergo redevelopment for a new town library. While conducting the initial GPR survey, I noted that there seemed to be significant changes in substrate GPR velocities over short distances as measured by curve matching of a single utility target. I returned to this site to investigate and potentially document these rapid, lateral changes in substrate GPR velocities.

I conducted a 10' by 75' GPR imaging grid project with 5-foot line spacing (Figure 1) along the axis of a previously imaged, continuous stormwater pipe that runs from the edge of a street to a stormwater catch basin located in a parking lot (Figures 2, 3 and 4). This stormwater pipe had a 12" diameter and a visible initiation and termination points (Figures 2 and 3). The depth to the top of this metal stormwater pipe at the catch basin measured 30 inches (Figure 4).

Selected results of the GPR grid project are presented in Figures 5, 6 and 7. The GPR image profile along the axis of the metal stormwater pipe has a strong top of pipe reflection that varies in depth and amplitude from the stormwater catch basin to the street catch basin (Figure 5). Symmetric hyperbola reflections from the metal stormwater pipe are apparent in the multiple north-to-south GPR image profiles (Figure 6). A US Radar, Inc. Quantum Imager, used in this study, can estimate the dielectric constant of the substrate by using the curve (hyperbole) matching technique. The dielectric constants were determined for eight successive perpendicular GPR image lines 5 foot apart over a distance 35 feet (Figure 7) where the surface appeared to be very uniform (asphalt parking lot, see Figures 1, 2 and 3). The estimated dielectric constants determined every 5-feet shows high variability (approximately 30%) over a short distance of 35 feet (Figure 7). It is my opinion that the apparent roller coaster like depth profile illustrated in the up-the-axis GPR image profile of the stormwater pipe (Figure 7) is primarily controlled by changes in substrate properties. When EM velocities change along a GPR image line whose target depths are calculated from a single soil velocity estimate, target depth errors will occur. In this case, an unrealistic, imaged stormwater pipe run profile (Figure 5) is due to significant lateral changes in substrate GPR velocities that are not accounted for in the depth calculations.



Fig. 4: Picture of the open "Storm Water Catch Basin" in the parking lot imaging the termination point of the  $\sim$ 12" diameter, metal corrugated storm water pipe. The top of the pipe is approximately 30" from the surface.

#### The Take Aways

1) This GPR project demonstrates that GPR depth estimate errors using a single estimated GPR velocity for a project area are possible with changing substrate properties.

2) The internal geometry of subsurface 3D GPR project image cubes and cross-sections can be distorted by lateral and vertical changes in substrate GPR velocities (EM properties). Depth distortions occur when using a single GPR velocity.

3) GPR depth determinations should only be considered estimates. If depth values are essential to the project objectives, direct exposure, or direct probing of the imaged target(s) should be completed to establish accurate depths.

![](_page_5_Figure_10.jpeg)

Fig. 5: GPR image grid using selected east to west and north to south GPR lines of the stormwater pipe.

![](_page_5_Picture_12.jpeg)

of the stormwater pipe. Eight consecutive north to south GPR lines across the asphalt parking lot surface were used to investigate lateral changes in subsurface GPR velocities using the GPR reflections from the stormwater pipe. A velocity was estimated for each successive target reflection (stormwater pipe) using a curve matching technique.

Fig. 7: The curve matched GPR velocities for each successive GPR target reflection of the stormwater pipe is illustrated above the successive GPR image profiles. Note that there is an ~30% change in subsurface velocities over a 35-foot distance along the stormwater pipe. This result implies that depth estimates made in a project area using a single GPR velocity could have very significant depth errors.

#### Excavation Safety Damage Prevention is a Process: All In Is the Only Way Forward

Author: Guy McIntosh, DocuSite

verall, the Common Ground Alliance and their stakeholders have done a tremendous job in helping to eliminate damages to underground facilities. I believe that the CGA's Best Practices committees have been among the greatest assets to damage prevention. Their marketing of the message to "Call 811 Before You Dig" has reduced many instances of underground utility damages, but is it still enough going forward?

A large amount of money and resources have been spent by the CGA to market the "Call 811 Before You Dig" message, and according to the CGA's DIRT report, this message is working. However, in that same report, 52% of utility damages in 2017 were noted as due to "excavation practices not sufficient." Given this contradiction, I'd like to present to you why I feel that the CGA's campaign to widely spread excavating best practices needs far more resources to be most effective. Please do not misunderstand me. I am not saying that there isn't a great deal of effort going on to promote and educate the excavation community on the excavation best practices. I just think there needs to be a lot more. The excavators and their trade associations that have been part of CGA and best practices committees for years are not causing these types of damages. It's the many that do not know of the CGA or have not been educated on these practices.

#### Some Statistics on Damages

To provide a higher-level overview of the root causes, the Data Committee groups root causes into major groups as per Table 5, p. 19 in the 2017 DIRT report (https://commongroundalliance.com/media-reports/dirtreport-2017), demonstrating that the leading root cause group is "Excavation Practices Not Sufficient." This group accounts for 142,980 damages.

Total Reported Damages: 273,628 Excavation Practices Not Sufficient: 142,980 – 52.3% Notification Not Made: 64,189 – 22.8% Notification Practices Not Sufficient: 5,645 – 0.99% Locating Practices Not Sufficient: 46,056 – 16.8% Miscellaneous: 14,758 – 5.8%

In addition to data compiled by the CGA, the Pipeline and Hazardous Materials Safety Administration (PHMSA), a United States Department of Transportation agency, has collected data on more than 3,200 natural gas pipeline related accidents deemed serious or significant since 1987 (https://www.phmsa.dot.gov/data-and-statistics/pipeline/pipeline-incident-20-year-trends).

![](_page_6_Picture_8.jpeg)

Using the DocuSite Mobile App for excavation projects and site safety.

#### **About DocuSite**

Our company DocuSite had a booth at the latest Con-Expo, one of the biggest construction expos in the world. We were promoting and sharing DocuSite's Mobile App and CGA's excavation best practices with excavation companies that were visiting our booth. However, I was shocked by the number of companies that have never heard of the CGA or its excavation best practices! If excavators truly used the CGA excavation best practices, this could eliminate a lot of damages due to "Excavation Practices Not Sufficient."

Let's examine some potential solutions. Many states require safe digging practices along with OSHA. However, I believe enforcement is not the only key to preventing utility damages. We need to expand education and promote safe digging practices just like all the campaigns we see to "Call 811 Before You Dig." We need to educate the people doing the digging on the potential danger to themselves and the public that can be caused if they do not use safe digging practices. I also believe that by documenting (having a checklist, taking photos and videos, and filling out forms such as pothole logs, etc.) their project from start to finish, excavators can avoid potential unsafe digging damages to underground utilities. Damage prevention is a process, and everyone needs to do their part. This includes one-call centers, utility locators, excavators and all stakeholders involved in the damage prevention process.

### Checklists for Excavation Project & Site Safety

#### Documenting excavation projects from start to finish works!

These checklists come from my own direct experience with over 34 years in the industry as an owner/operator of an excavating company and a locating company along with being on the CGA best practice committees since inception in 1999. We created the DocuSite Mobile App with these important checklists to give underground utility construction businesses a tool for the greatest challenge they have in avoiding utility damages.

Here is a sample list of items to check off as completed by excavating personal before, during and after all excavation projects:

#### **PRE-EXCAVATION:**

- Do not dig without locate marks.
- Complete and sign all safety checklists prior to excavation taking place.
- Before you leave the shop, obtain 811 ticket numbers and
- Check to see if locates have been completed (look at the due date).
- Make sure you have a copy of the 811 tickets at the job site at all times.

#### **ON THE JOBSITE:**

- Pre-Survey (checking for locates).
- Check for field sketch or documentation that all the utilities have marked their lines.
- Check for all visible facility marks on the ground.
- Verify all service feeds from buildings and homes and that they have been located and/or that they are aerial.
- Draw a sketch, take photos and/or videos of the marked facilities for future use.
- Check for any visible signs of pedestal, riser, new trench lines that may have been missed in your dig area.
- Check to make sure that the dig area is defined and is the same on 811 tickets.
- Check for any private facilities not located. If they are not located, locate them or contact someone to get them located.
- If there are any high priority facilities in your dig area, make sure facility owner/locator is on job site and/or has been contacted for advice. If lines are not located completely, call 811 and contact the responsible party.

#### **PUBLIC & PRIVATE UTILITIES:**

• Ask for assistance from the homeowner and utilized locating equipment, and use common sense.

- Locate septic lines.
- Locate water yard lines.
- Locate private power lines to sheds, wells, invisible fences.
- Locate private gas or propane lines.
- Locate sprinkler lines and heads and drip systems.
- Draw a sketch of locations for all private facilities on the job site.
- Locate all telecommunication cable (television, phone, fiber optics, etc.).

#### EXCAVATING:

- If paralleling or working on a critical or high priority line, pothole, or use locating equipment to expose and verify the location and depth of the facility every 100 feet.
- Hand dig within 24 inches (or as required in your state) of lines, peds, pole risers, meters or other structures.
- Bore away from facilities.
- Verify depth of any facilities bored across, change route or depth as required, and notify supervisor.
- Do not place excavated dirt on locating marks, flags, whiskers, etc.
- Support all lines exposed during excavation to avoid kinks or other damage.

#### **BACKFILLING:**

- Shade all lines placed or exposed with good fill dirt.
- Verify all fill dirt is free from rocks, cable trash, crew trash, and large dirt clods.

As an excavator, you are responsible for verifying that all facilities within the dig area have been located. You are responsible for locating all private and public facilities. Have the homeowner assist you if needed.

## ACCURACY 5 m 37.49256°N DIRECTION DATUM WGS84 113 deg(T) 122.21338°W Ο PH-129 AECOM 20 SS CONCRETE CAP BTL-7446 15:0 @27"...

#### About the Author

Guy McIntosh has over 34 years of experience in the underground utility locating services, underground utility construction and utility field services industry. He started in 1983 as the co-founder/owner of a now very large utility excavating company, Kelly Cable Corp/SiteWise, and in 2005 was co-founder/co-owner of an underground locating company, Safe Site Inc. Guy was chair of the committee that developed the first NULCA locating training standards in 1995 and has been a past President and Board of Directors member of NULCA. Selected to represent the locating industry, Guy served on the 1999 National Committee Commissioned by the Office of Pipeline Safety to help develop and write the "Best Practices for Pipeline Damage Prevention.". In June 1999, Rodney Slater, Secretary of the U.S. Department of Transportation, nationally recognized and honored Guy McIntosh for his efforts in keeping America safe through pipeline damage prevention. Guy is the co-founder of DocuSite. **Left:** Photo of a utility exposed using vacuum excavation with GPS coordinates. This is a sample of the type of documentation that should be collected before excavation starts.

**Below:** Sample of photo documentation taken with DocuSite's mobile app.

![](_page_7_Picture_5.jpeg)

![](_page_7_Picture_6.jpeg)

![](_page_7_Picture_7.jpeg)

![](_page_7_Picture_8.jpeg)

# GET MORE THAN EMPTY PAINT CANS FOR YOUR EFFORT

Utility Locating Equipment Should Give You More Than Just "Paint Here"

## ...STAY TUNED

![](_page_7_Picture_13.jpeg)